ROBO3 gene

roundabout guidance receptor 3

Normal Function

The *ROBO3* gene provides instructions for making a protein that is critical for the normal development of the nervous system. The protein is active in the developing spinal cord and in the brainstem, a region that connects the upper parts of the brain with the spinal cord. In the brainstem, the ROBO3 protein helps direct nerve cells (neurons) to their proper positions in a process called neuronal migration. The protein also helps guide the growth of axons, which are specialized extensions of neurons that transmit nerve impulses throughout the nervous system. Some axons are very long, connecting neurons in the brain with those in the spinal cord and elsewhere in the body.

For the brain and body to communicate effectively, certain bundles of axons must cross from one side of the body to the other in the brainstem. These include axons of motor neurons, which transmit information about voluntary muscle movement, and axons of sensory neurons, which transmit information about sensory input (such as touch, pain, and temperature). The ROBO3 protein plays a critical role in ensuring that this crossing over occurs during brain development.

Health Conditions Related to Genetic Changes

horizontal gaze palsy with progressive scoliosis

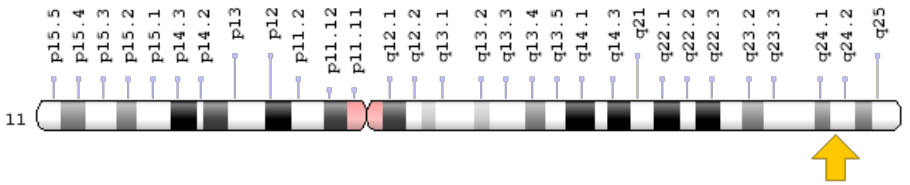
At least 19 different mutations in the *ROBO3* gene have been identified in people with horizontal gaze palsy with progressive scoliosis (HGPPS). These mutations change the structure of the ROBO3 protein in different ways; however, all of the mutations appear to result in a nonfunctional protein. A lack of functional ROBO3 protein disrupts normal brainstem development.

In people with HGPPS, the axons of motor and sensory neurons do not cross over in the brainstem, but stay on the same side of the body. Researchers believe that this miswiring is the underlying cause of the eye movement abnormalities associated with the disorder. The cause of progressive scoliosis in HGPPS is unclear. Researchers are working to determine why the effects of *ROBO3* mutations appear to be limited to horizontal eye movement and scoliosis.

Chromosomal Location

Cytogenetic Location: 11q24.2, which is the long (q) arm of chromosome 11 at position 24.2

Molecular Location: base pairs 124,865,409 to 124,881,474 on chromosome 11 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- FLJ21044
- HGPS
- RBIG1
- retinoblastoma inhibiting gene 1
- RIG1
- ROBO3_HUMAN
- Roundabout homolog 3
- Roundabout-like protein 3
- roundabout, axon guidance receptor, homolog 3
- roundabout, axon guidance receptor, homolog 3 (Drosophila)

Additional Information & Resources

Educational Resources

- Neuroscience (2nd edition, 2001): The Brainstem and Its Importance in Clinical Neuroanatomy
  https://www.ncbi.nlm.nih.gov/books/NBK11061/?rendertype=box&id=A61

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28ROBO3%5BTIAB%5D%29+OR+%28Roundabout+AND+homolog+AND+3%5BTIAB%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

OMIM

- ROUNDABOUT, DROSOPHILA, HOMOLOG OF, 3
  http://omim.org/entry/608630

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_ROBO3.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=ROBO3%5Bgene%5D
- HGNC Gene Family: Fibronectin type III domain containing
  http://www.genenames.org/cgi-bin/genefamilies/set/555
- HGNC Gene Family: I-set domain containing
  http://www.genenames.org/cgi-bin/genefamilies/set/593
- HGNC Gene Family: Immunoglobulin like domain containing
  http://www.genenames.org/cgi-bin/genefamilies/set/594
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=13433
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/64221
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